



## IDENTIFYING DATA

### Mathematics: Mathematical methods

Subject	Mathematics: Mathematical methods			
Code	O07G410V01301			
Study programme	Grado en Ingeniería Aeroespacial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	2nd	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Cid Iglesias, María Begoña			
Lecturers	Cid Iglesias, María Begoña			
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Web	<a href="http://aero.uvigo.es">http://aero.uvigo.es</a>			
General description	The objective of this subject is that the students know and master the basic techniques of the complex variable and its applications, the partial differential equations and their applications; necessary both for other subjects of the degree and for professional practice.			
	English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

## Training and Learning Results

Code	
B2	Planning, documentation, project management, calculation and manufacturing in the field of aeronautical engineering (in accordance with what is established in section 5 of order CIN / 308/2009), aerospace vehicles, propulsion systems, aerospace materials, airport infrastructures, air navigation infrastructures and space management, air traffic and transport management systems.
C32	Appropriate knowledge applied to engineering: methods of calculation and development of materials and defence systems; management of experimental techniques, equipment and measuring instruments; numerical simulation of the most significant physical-mathematical processes; inspection, quality control and fault detection techniques; their most appropriate methods and repair techniques.
D1	Capability of analysis, organization and planification.
D3	Capability of oral and written communication in native language
D4	Capability of autonomous learning and information management
D5	Capability to solve problems and draw decisions
D6	Capability for interpersonal communication
D8	Capability for critical and self-critical reasoning

## Expected results from this subject

Expected results from this subject	Training and Learning Results		
LO1: Knowledge and understanding of the basic technicians of Complex Variable that are of application in the field of the Aerospace Engineering.	B2	C32	D1 D3 D4 D5 D6 D8

LO2: Understanding the basic models that, in the form of partial differential equations are applicable in Aerospace Engineering. Knowledge and application of the methods of basic resolution for this type of models.

B2 C32 D1  
D3  
D4  
D5  
D6  
D8

### Contents

Topic	
Complex variable	<ol style="list-style-type: none"> <li>1. Analytical functions.</li> <li>2. Integration in the complex field.</li> <li>3. Series.</li> <li>4. Residues and poles.</li> <li>5. Z transform.</li> </ol>
Series of Fourier	
Partial differential equations	<ol style="list-style-type: none"> <li>1. Introduction.</li> <li>2. The potential equation.</li> <li>3. The heat equation.</li> <li>4. The wave equation.</li> </ol>
Integral transforms	<ol style="list-style-type: none"> <li>1. Fourier transform.</li> <li>2. Laplace transform.</li> <li>3. Resolution of partial differential equations by means of integral transform.</li> </ol>

### Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Lecturing	29	60	89
Problem solving	15	15	30
Autonomous problem solving	0	17.5	17.5
Practices through ICT	5	5	10
Essay questions exam	2.5	0	2.5

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

### Methodologies

	Description
Introductory activities	Activities directed to take contact and gather information on the students, as well as to present the subject.
Lecturing	The professor will expose in the theoretical classes the contents of the matter that illustrate with numerous examples and applications. The students will have basic texts of reference for the follow-up of the subject
Problem solving	Approach, analysis, resolution and debate of a problem or exercise related with the matter given, so much by part of the educational as of the students. To illustrate and complete the explanation of each lesson and to help to that the student purchase the necessary capacities.
Autonomous problem solving	The student will have to resolve similar exercises to the realised in class to purchase the necessary capacities.
Practices through ICT	The student will use computer tools to resolve problems and exercises and apply the knowledges obtained in the classes of theory, and the student will have to resolve similar exercises to purchase the necessary capacities.

### Personalized assistance

Methodologies	Description
Lecturing	The professor will attend personally the doubts and queries of the studentes. They will attend doubts in shape face-to-face, especially in the classes of problems and laboratory and in tutorials, as of form no face-to-face, by the available telematic systems for the subject.
Problem solving	The professor will attend personally the doubts and queries of the studentes. They will attend doubts in shape face-to-face, especially in the classes of problems and laboratory and in tutorials, as of form no face-to-face, by the available telematic systems for the subject.
Autonomous problem solving	The professor will attend personally the doubts and queries of the students. They will attend doubts in shape face-to-face, especially in the classes of problems and laboratory and in tutorials, as of form no face-to-face, by the available telematic systems for the subject.

<b>Assessment</b>						
	Description	Qualification	Training and Learning Results			
Problem solving	There will be a written test for each of the parts of the subject in order to evaluate the resolution of exercises and/or problems in an autonomous way. Each test will have a weight of 30%.  L01, LO2	60	B2	C32	D1 D3 D4 D5 D6 D8	
Essay questions exam	Realization of a final exam in which they collect the corresponding contents to the master sessions and to the resolution of problems.  L01, LO2	40	B2	C32	D1 D3 D4 D5 D6 D8	

### **Other comments on the Evaluation**

The preferred mode of assessment is continuous assessment. The student has the right to opt for the overall assessment (100% of the grade on the official date) according to the procedure and deadline established by the centre for each call.

In any call it is necessary to obtain 5 points to pass the subject. The maximum duration of any exam will be 3 hours. Since the subject has two distinct parts, it will be necessary to have a minimum of 2 points out of 5 in each part. In the case of obtaining a grade lower than 2 points in any of the parts, the final grade that will appear in the certificate will be the sum of both notes limiting it to a maximum of 4.8 points. (\*)

#### **Second call evaluation:**

An examination will be carried out to assess the learning outcomes and the achievement of the competences indicated in the teacher's guide. This exam will provide 100% of the rating of this call.

In the case of having obtained a minimum of 3 points in one part (and not having reached 2 points in the other part), the student can choose to perform only the suspended part or the complete exam. The criterion indicated in (\*) will also apply.

#### **Exam-only assesment procedure (any call):**

An examination will be carried out to assess the learning outcomes and the achievement of the competences indicated in the teacher's guide. This exam will provide 100% of the rating of this call. The criterion indicated in (\*) will also apply.

#### **Evaluation dates:**

The evaluation schedule officially approved by the EEAE is published on the website <http://aero.uvigo.es/es/docencia/examenes/>

It is expected that the students present a suitable ethical behaviour. In case to detect an ethical behaviour no suitable (copy, plagiarism, utilisation of electronic devices non authorised, and others) will consider that the student does not gather the necessary requirements to surpass the subject. In this case the global qualification in the present academic course will be of suspense (0.0).

It remembers the prohibition of the use of mobile devices or portable computers in exercises and practical since the Royal decree 1791/2010, of 30 December, by which approves the Statute of the University Student, establishes in his article 13.2.d), relative to the duties of the university students, the duty of :

*"Abstain of the utilisation or cooperation in fraudulent procedures in the proofs of evaluation, in the works that realise or in official documents of the university".*

### **Sources of information**

#### **Basic Bibliography**

Churchill, Churchill, R.V.; Brown, J.W., **Variable Compleja y Aplicaciones**, Mc Graw-Hill, 1991

Haberman, R., **Ecuaciones en derivadas parciales con series de Fourier y problemas de contorno**, Prentice Hall, 2003

Marcellán, F.; Casasús, L.; Zarzo, A., **Ecuaciones diferenciales. Problemas lineales y aplicaciones**, Mc Graw-Hill, 1991

Pestana, D., Rodríguez J.M.; Marcellán, F., **Variable compleja. Un curso práctico**, Síntesis, 1999

Zill, D.G.; Cullen, M.R., **Matemáticas avanzadas para Ingeniería 2. Cálculo vectorial, análisis de Fourier y análisis complejo**, Mc Graw-Hill, 2008

#### **Complementary Bibliography**

Carrier, G.F., **Partial differential equations: theory and technique**, Academic Press, 1988

Farlow, S.J., **Partial differential equations for scientists & engineers**, John Wiley & Sons, 1993

Gómez López, M.; Cordero Gracia, M., **Variable compleja. 50 problemas útiles**, García-Maroto, 2012

Parra Fabián, I.E., **Ecuaciones en derivadas parciales. 50 problemas útiles**, García-Maroto, 2007

Stephenson, G., **Introducción a las ecuaciones en derivadas parciales**, Reverté, 1982

Weinberger, H.F., **Ecuaciones en derivadas parciales**, Reverté, 1996

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## **Recommendations**

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### **Subjects that it is recommended to have taken before**

Mathematics: Linear algebra/O07G410V01102

Mathematics: Calculus I/O07G410V01101

Mathematics: Calculus II/O07G410V01201

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### **Other comments**

It is recommended assist to class and work the contents weekly.

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